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U. S. DEPARTMENT OF AGRICULTURE.  
BOTANICAL DIVISION.

SECTION OF VEGETABLE PATHOLOGY—CIRCULAR No. 6.

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TREATMENT OF BLACK ROT OF THE GRAPE.

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With the view of answering the queries of many correspondents, the following circular on the treatment of black-rot of the grape has been prepared.

NORMAN J. COLMAN,  
*Commissioner of Agriculture.*

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SIR: I have the honor to submit herewith a circular on the treatment of black-rot of the grape, prepared in accordance with your instructions.

B. T. GALLOWAY,  
*Chief of the Section of Vegetable Pathology.*

Hon. N. J. COLMAN,  
*Commissioner of Agriculture.*

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REMEDIES.

The experiments made in 1888 have demonstrated beyond question that the copper compounds, especially the Bordeaux mixture, can be relied on to prevent black-rot. Where the remedies were properly applied from 60 to 70 per cent. of the crop was saved.

In view of these facts the preparations which furnished the best results in 1888 are here given, with the urgent request that one or more of them be thoroughly tested during the coming season.

(1) SIMPLE SOLUTION OF SULPHATE OF COPPER.

Dissolve 1 pound of pure sulphate of copper in 25 gallons of water. While this preparation has, in a number of cases, been used with beneficial results, its employment, especially when the foliage is young and tender, can not be advised. For spraying the vines in spring, however,

before the leaves appear, it will doubtless prove as efficacious as any of the following mixtures, and is more easily prepared and applied.

(2) BORDEAUX MIXTURE.

(a) Dissolve 16 pounds of sulphate of copper in 22 gallons of water; in another vessel slake 30 pounds of lime in 6 gallons of water. When the latter mixture has cooled, pour it slowly into the copper solution, taking care to mix the fluids thoroughly by constant stirring.

(b) Dissolve 6 pounds of sulphate of copper in 16 gallons of water, and slake 4 pounds of fresh lime in 6 gallons of water. When cool, mix the solutions as described above.

This formula requires *fresh* lime. Air-slaked lime, or a paste made by allowing freshly slaked lime to settle, contains a large percentage of water; consequently, if they should be combined in the proportions indicated, there would not be sufficient lime to decompose the copper. Experience has shown that while 4 or even 3 pounds of fresh lime is sufficient to decompose 6 pounds of copper sulphate, it requires double that quantity of air-slaked lime and three times the amount of paste.

The manner of preparing the Bordeaux mixture may be modified in various ways. Colonel Pearson pulverizes the sulphate of copper, and then dissolves it in from 2 to 4 gallons of hot water. The lime is then slaked in the same way that masons slake it for mortar. This is strained into a box, left to settle and thicken, and then combined with the copper, adding water to the required amount.

(3) SOLUTION OF AMMONIACAL CARBONATE OF COPPER.

Into a vessel having a capacity of about 1 gallon, pour 1 quart of ammonia (strength 22° Baumé), add 3 ounces of carbonate of copper, stir rapidly for a moment, and the carbonate of copper will dissolve in the ammonia, forming a very clear liquid. For use, dilute to 22 gallons. So far as we know, this preparation has not been used in this country as a remedy against black-rot. As a preventive of mildew, however, it has given satisfaction. It is easily prepared and applied, and adheres firmly to the foliage.

(4) EAU CELESTE.

(a) Dissolve 1 pound of sulphate of copper in 2 gallons of hot water; when completely dissolved, and the water has cooled, add 1½ pints of commercial ammonia (strength 22° Baumé); when ready to use dilute to 22 gallons.

(b) Dissolve 2 pounds of sulphate of copper in 2 gallons of hot water; in another vessel dissolve 2½ pounds of carbonate of soda; mix the two solutions, and when all chemical reaction has ceased add 1½ pints of ammonia, then dilute to 22 gallons.



## TREATMENT.

To indicate a definite line of treatment that will be applicable to all regions is somewhat difficult. As a first step, however, every precaution should be taken to remove as much of the infectious material as possible. With this object in view the old leaves and rotten berries should be carefully collected in the fall or winter and burned or buried. The trimmings should also be burned as they often harbor thousands of the minute spores or reproductive bodies of the fungus.

In spring, after the vineyard has been pruned and put in order by the plow, but before vegetation starts, spray the vines thoroughly with the Bordeaux mixture, formula *a*, or with the simple solution of sulphate of copper. The object of this spraying is to destroy any spores of the fungus that may be hidden away in the crevices of the bark. About ten days before the flowers open, spray all the green parts of the vine with the Bordeaux mixture, formula *b*, taking care to wet the foliage thoroughly. Spray again with the same preparation when the flowers are opening, repeating the operation every three weeks until the fruit begins to color. The necessity for beginning the treatment early can not be too strongly urged; *it is absolutely necessary to insure success.*

For applying the remedies, spraying pumps with specially constructed nozzles are necessary. The Eureka sprayer, fitted with the improved Vermorel nozzle, answers the purpose admirably. With this machine, which is carried on the back, knapsack fashion, a man can spray from 5 to 6 acres of vines per day, and the cost of treating an acre in an average season, using the Bordeaux mixture as indicated above, need not exceed \$12. The price of this machine, including all the fittings, is \$20.60. Good pumps, suitable for vineyard use, are also manufactured by the Nixon Nozzle and Machine Company, of Dayton, Ohio. In all cases where the Bordeaux mixture is employed it will be best to use the improved Vermorel nozzles, for the reason that they are specially constructed to prevent clogging. These nozzles may be attached to any force-pump having the proper apparatus to make the connection. They are manufactured and sold by Thomas Somerville & Son, of Washington, D. C., the retail price being \$1.50 each, or \$15 per dozen.

